TROPICAL DISEASES BUREAU.

TROPICAL VETERINARY BULLETIN.

VOL. 4.] 1916. [No. 2.

THEILERIASIS.

(96) STRICKLAND (C.). **Observations on the Blood in East Coast Fever of Cattle.**—*Parasitology.* 1916. Jan. Vol. 8. No. 3. pp. 244–248.

In this paper are recorded a few observations made by the author in 1911.

A small series of blood counts made with the blood of cows prior to infection with East Coast fever and within a day of death showed that, as is generally recognised, there is only a very small amount of blood destruction in this disease. On the other hand the number of corpuscles present in the blood of a dog infected with *Piroplasma canis* was found to diminish by about half a million per day.

Haemoglobin estimations were made by BARCROFT'S method, which essentially consists in measuring the pressure of oxygen given off when a given volume of fully oxidised blood is reduced by potassium ferrocyanide, the pressure in the case of a known weight of haemoglobin being known. This method is very delicate but too complex for ordinary purposes.

The results indicated that the amount of haemoglobin present in the blood does not undergo any sensible alteration.

In estimating the specific gravity of the blood the drops of blood were placed in jars containing mixtures of alcohol and xylol of different specific gravities. It was found that there was a slight decrease of specific gravity in each case.

Estimation of the white corpuscles present in the blood showed that there was a very marked leucopenia. In a dog infected with *Piroplasma canis* there was distinct leucocytosis.

Differential counts were made on three occasions with the blood of one cow. About a week after the appearance of the parasites in the blood the eosinophiles numbered 13·6 per cent. Subsequently this figure fell to 2. The leucopenia was found to be due to a relative decrease in the number of cells other than the polymorphonuclears.

(97) YAKIMOFF (W. L.). **A propos de la note de M. Rodhain sur *Theileria ovis*.** [A propos of Rodhain's Note on *Theileria ovis*.]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. p. 201.

In connection with the paper recently published by RODHAIN regarding the occurrence of *Theileria ovis* [see this *Bulletin*, Vol. 4, No. 1, pp. 12–14], the author draws attention to the fact that at the Third Russian Veterinary Congress at Kharkow in 1913 he announced his discovery of a parasite of the Theileria type in sheep in Turkestan.

(C270) Wt. P10/4. 1000. 6.16. B.& F.Ltd. Gp.11/5. A

TRYPANOSOMIASIS.

(98) Woelfel (K.) **Beitrag zur Kenntnis der Tsetse (*Glossina morsitans*) und der Trypanosomiasis.** [Tsetse Flies (*Glossina morsitans*) and Trypanosomiasis.]—*Zeitschr. f. Infektionskrankh. parasit. Krankh. u. Hyg. d. Haust.* 1915. Aug. Vol. 17. No. 1–2. pp. 19–36. With 1 map.

This paper is a revised summary of two papers published in 1911.

Tsetse flies are widely distributed through German East Africa, the largest infested area being Tabora, occupying the greater part of the western half of the Protectorate. According to the natives there are certain areas which have been invaded by the flies comparatively recently, and there is other evidence in support of this statement.

The first record of their occurrence in the district north of Tabora town is that of Lichtenfeld in 1907. Since that date they have steadily increased in numbers.

The flies are found not only along the course of the rivers and streams, but in the wooded country everywhere. As a general rule the flies are more numerous where game abounds. Contradictory views have been expressed by different observers regarding the seasonal distribution of the flies. The author's observations indicate that they generally increase during the rains and reach their maximum just at the beginning of the dry season.

No rule can be laid down with regard to their activity during the day, but it is exceptional to find them active before 7 a.m. Between noon and 3 p.m. they do not appear to be so voracious, but from that time to sunset they are extremely active. There are, however, many exceptions to these indications.

The nature of the weather does not appear to exercise any marked influence upon their activity.

The flies cannot exist in bare country, and it was found by experiment that in wooded country the clearing of a space three hundred metres wide on either side of a road was not sufficient to keep it clear of flies during the dry weather. The flies are unable to live at altitudes greater than 1,300 to 1,400 metres.

Man, mammals, birds, and reptiles are all preyed upon by tsetse flies. In the case of man they generally settle upon the back or the neck, but in animals they more usually select the under side of the body where there is shadow.

Examination of 642 flies showed that 3 per cent. contained trypanosomes. In different districts the number ranged from 1·5 to 10 per cent., the latter number being registered in an area where very few flies were examined.

The blood of sixty-one animals was examined in smears and thick films, and trypanosomes were found in four. In ten cases dogs were inoculated without success, and in six instances attempts were made to cultivate trypanosomes, but no positive results were obtained.

Nagana is very common among the domesticated animals. Native donkeys and cattle appear to recover spontaneously. Attempts to treat infected animals with atoxyl and arsenic yielded very uncertain results. In two cases animals treated with the former drug developed amaurosis, but this was not certainly due to the drug. Salvarsan and trypasafrol also failed to effect cures.

BRITISH MUSEUM

(99) Fiori (C.) & Delanoë (Mme. P.). **Au sujet du dimorphisme du Trypanosome de Mazagan. Deuxième Note.** [The Dimorphism of the Mazagan Trypanosome.] *Bull. Soc. Path. Exot.* 1916. Mar. Vol. 9. No. 3. pp. 130–133. With 1 plate, comprising 19 figs.

The authors in a previous communication have shown that the polymorphic trypanosome which they found in a naturally infected horse, when passed into white rats tended to become monomorphic, the parasites without a free flagellum becoming more scanty.

The strain after passage through two dogs was inoculated into a rabbit, and in this animal the dimorphism of the parasite was well maintained. Sixty-one parasites were drawn and measured, and the results showed that apart from the slightly shorter length of the flagellum of the trypanosome in the rabbit, there were no material differences from the parasite as it occurred in the naturally infected horse.

(100) Yakimoff (W. L.) & Wassilewsky (W. J.). **Le traitement de la trypanosomiase des chameaux du Turkestan russe.** [The Treatment of Camel Trypanosomiasis in Russian Turkestan.]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. p. 230.

In this preliminary note the authors summarise the results that they have obtained in the treatment of mice infected with the camel trypanosome by means of various drugs.

With atoxyl administered in full subtoxic doses relapses always occur, and arsinosolvine yields similar but slightly inferior results.

Salvarsan is the best drug for the treatment of the infection.

Emetic acts successfully only when doses that are almost toxic are given.

Trixidin is a good remedy; the minimum dose to effect a cure is 0·001 g. per kilo.

Trypanblue fails even when toxic doses are given, and dianilblue gives slightly better results.

Repeated injections of either atoxyl or emetic fail to effect permanent cures. Similarly, atoxyl or emetic in combination with trypanblue or dianilblue have not yielded any positive results.

(101) Yakimoff (W. L.) & Schokhor (N. J.). **A propos du *Trypanosoma theileri* au Turkestan russe.** [*Trypanosoma theileri* in Russian Turkestan.]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. p. 229.

In 1913 the authors announced the discovery of *T. theileri* or a related type in the blood of cattle at Taschkent by cultivation in ordinary broth. Examination of blood from 1,000 animals by the microscope failed to reveal a single trypanosome.

They now state that they have found a trypanosome of this type in the course of the examination of 193 liver smears.

(102) Rodhain (J.) & Van den Branden (F.). **Sur la réceptivité de la roussette, *Cynonycteris straminea*, aux différents virus de trypanosomes africains.** [The Susceptibility of the Flying-Fox to Different Strains of African Trypanosomes.]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 234–236.

The authors have failed to infect flying-foxes with *T. lewisi*, *T. cazalboui* (*vivax-angolense*) and *T. congolense*.

They have fatally infected two with *T. gambiense*. Death occurred in 52 and 68 days respectively.

Observations indicated that *T. gambiense* does not undergo any development in *Cyclopodia greffi*, which swarmed on the animals.

(103) Bouet (G.). **Existence d'un petit foyer de trypanosomiase humaine à la Basse Côte d'Ivoire.** [The Existence of a Small Centre of Human Trypanosomiasis in the Coastal Area of the Ivory Coast.]—*Bull. Soc. Path. Exot.* 1916. March. Vol. 9. No. 3. pp. 168–186.

Up to 1913 the coastal region of the Ivory Coast appeared to be free from human trypanosomiasis, although the disease was endemic and had been so for many years in the upper parts of the colony. In 1913 a case was detected in a native child which had never been outside the area, and investigation revealed a second case in a child in Bingerville, the capital. Events made it impossible to complete the investigation.

In seeking the reservoir of the virus an examination of the domesticated animals was undertaken, but with entirely negative results, no trypanosome resembling *T. gambiense* being found.

The investigations have however enabled the author to confirm his previous work regarding the endemicity of *T. dimorphon* in the Ivory Coast. This was in fact the only trypanosome discovered in animals that had lived for a long time in the capital (in the government herd).

Among the animals brought down for slaughter or conveyed from the north by rail *T. cazalboui* was found, this also confirming previous investigations.

The dwarf cattle of the forest and coast regions have acquired a high degree of resistance to infection with *T. dimorphon*, but imported Soudanese cattle are rapidly killed by the infection. The native cattle in the northern area, where *T. cazalboui* is common, have in the course of time acquired a high degree of resistance to *T. cazalboui*.

Examination of flies showed that not one out of 450 capable of carrying the human trypanosome was infected. On the other hand 3·7 per cent. of the flies were found to be infected with *T. dimorphon*. A single fly out of 450 was found to be infected with *T. cazalboui*, but this infection was probably derived from one of the northern animals brought down for slaughter.

(104) STUEHMER (A.). **Ueber lokale ("primäre") Krankheitserscheinungen an der Stelle der Infektion bei der Nagana-Erkrankung des Kaninchens ("Trypanosomenschanker"). Ihre Bedeutung für die Beurteilung des Verlaufes der Kaninchentrypanosomiasis. Uebergang des "primären" in das "sekundäre" Krankheitsstadium (Rezidivstammbildung).** [The Local or Primary Symptoms at the Seat of Inoculation of Rabbits inoculated with Nagana. The Transition from the Primary to the Secondary Stage.]—*Zeitschr. f. Immunitätsforsch.* I. Teil. Orig. Mar. 1914. Vol. 24. No. 4. pp. 315–335.

The author points out that investigations connected with the treatment of syphilis are hindered by the difficulty of producing generalised disease in animals, and he has therefore carried out a series of experiments with rabbits infected with nagana, there being some similarity in the course of the two infections, particularly in the early stages.

STARGARDT, whose publication the author refers to, was able to produce chancre-like lesions in rabbits infected with nagana, and Stühmer has used the Morgenroth strain of trypanosomes from the Ehrlich Institute for a similar series of experiments. He has been able to produce the local lesions in every case.

His procedure was to inoculate the animals into the connective tissue immediately above the limbus corneae with a suspension of trypanosomes obtained from mice inoculated intraperitoneally.

No abnormality was observed at the seat of inoculation until the second or third day when there was swelling and congestion of the cornea. In some cases the swollen tissues became pale red, and in other cases a dark bluish-red. In some instances there was also some slight turbidity of the upper part of the cornea. By the fifth day the inflammatory process had spread to the surrounding tissues and the condition reached its maximum on the following day, after which the symptoms gradually disappeared.

In some instances the author was able to find trypanosomes in large numbers in the liquid obtained by slightly scarifying the swollen membrane, and they were extraordinarily numerous by the third day. They could not be detected in the blood even by inoculation at this stage. Inoculation tests generally revealed the presence of trypanosomes in the blood on the fourth or fifth day.

The author was able to produce a similar local lesion by inoculating into the scrotum.

Microscopic examination of the local lesion of the eye showed that surrounding the inflamed tissues at the seat of inoculation there was produced a cellular infiltration mainly composed of plasma cells and polynuclear leucocytes.

In the scrotal lesion the zone of cells closest to the seat of inoculation was composed almost exclusively of polynuclears, the plasma cells being present in large numbers in the oedematous area external to this. Around the vessels there was a marked small-celled infiltration.

Trypanosomes could be detected at the seat of inoculation, but they were scanty or absent in the oedematous tissues surrounding it. It was only in the immediate neighbourhood of the vessels that they could be discovered.

These lesions are called the primary lesions of trypanosomiasis and they are compared by the author to the primary lesions of syphilis.

The author shows that in inoculated rabbits there is a development of antibodies which leads to the disappearance of parasites from the blood after they have first made their appearance there, and that the trypanosomes which reappear in the blood differ biologically from those which first appear in the blood in that they are resistant to antibodies.

By inoculating a rabbit at short intervals he shows that the capacity of the parasites for producing the local lesions gradually becomes less as the antibodies produced by the first inoculation increase.

The so-called antibody-resistant strain of trypanosomes which occurs in the blood after the first disappearance of parasites is responsible for secondary lesions involving the genitals, lips, ears, etc.

(105) Rodhain (J.) & Van den Branden (F.). **Action comparative des matières colorantes : tryparosan et trypanbleu et des arsenicaux : salvarsan cuprique, sur les trypanosomes animaux africains des groupes *congolense* et *angolense* (*cazalboui-vivax*).** [The Comparative Effects of Colouring Materials : Tryparosan and Trypanblue and Arsenical Compounds : Copper Salvarsan on African Animal Trypanosomes belonging to the *Congolense* and *Angolense* Groups (*cazalboui-vivax*).]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 236–241.

A sheep, a ram, a goat, a native pig, and two guinea-pigs infected with *T. congolense* were treated with tryparosan administered by the mouth, in a dose of 0·5 g. per kilo. In every case trypanosomes disappeared from the circulation and did not reappear during the periods for which the blood of the various animals was subsequently examined. These periods were in most cases about a month, but in one instance extended to eight months.

Trypanblue administered either by the mouth or by intravenous injection failed to disperse the trypanosomes and failed to alter the course of the disease.

Copper-salvarsan injected intravenously into two sheep infected with *T. congolense* in a dose of 0·008 g. per kilo. failed to cause the disappearance of the parasites.

In a previous publication the authors have shown that *T. cazalboui* (*vivax*) is susceptible to tryparosan, and in this paper two further experiments are quoted in support of this.

In one case a sheep was given 0·6 g. intravenously in error, the intended dose being 0·3 g. Intense dyspnoea resulted and the sheep was in a dangerous condition for a couple of hours, but recovery took place and no relapse was observed.

In the second case the sheep received 0·3 g. intravenously. Trypanosomes disappeared but returned in about three weeks. A further dose of 0.35 g. apparently effected a cure as no trypanosomes were discovered during the next three months.

Trypanblue failed to produce any effect upon *T. cazalboui* (*vivax*), and, similarly, salvarsan copper was practically without effect.

(106) Bouilliez (M.). **Contribution à l'étude et à la répartition de quelques affections parasitaires au Moyen Chari (Afrique Centrale).** [Certain Diseases occurring in the Middle Shari Area (Central Africa).]—*Bull. Soc. Path. Exot.* 1916. Mar. Vol. 9. No. 3. pp. 143–167. With 6 text-figs. and 1 map.

In this report the author deals with the following conditions:—Human trypanosomiasis, Animal trypanosomiasis, Leishmaniasis, Malaria, Piroplasmosis, Filariasis, and Goitre.

With regard to the first of these the author has investigated the distribution of the disease and the degree of incidence in endemic areas. For the identification of the trypanosome a certain number of animal inoculations have been carried out. The resulting infections have resembled those caused by *T. gambiense*, but have always been rather less virulent. In stained preparations the parasite appeared to be identical with *T. gambiense*, and no posterior-nuclear forms were found. The author therefore thinks that the parasite is not *T. rhodesiense*, but that if its feeble pathogenicity is a sufficient character for the creation of a species it is possibly *T. nigeriense*.

No specimens of *G. palpalis* have been found, and the author thinks that *G. morsitans* and *G. tachinoides* must be excluded as transmitters of the disease as they are both common all along the banks of the rivers while sleeping sickness has a very localised distribution.

Among the large domesticated animals pathogenic trypanosomes have been found in horses, asses, cattle, and kids. The parasite most frequently found, and possibly the only autochthonous one, is *T. pecaudi*.

Other species have been detected, but only in animals passing through the district or brought into it from elsewhere.

T. pecaudi is a very frequent cause of death among horses and it has been discovered on many occasions in asses, but it is only rarely present in the blood of the other species mentioned.

Two opportunities presented themselves of treating horses affected with baleri. Atoxyl and orpiment were used, but without success in both cases.

T. cazalboui and *T. dimorphon* have also been found, the latter in a donkey from the Egyptian Soudan. Details are given of a number of experimental inoculations carried out with the latter trypanosome.

Another trypanosome found in a horse, which in all probability came from Léré, presented morphological characters which recalled *T. congolense*, *T. nanum*, and *T. pecorum*. But the second of these appeared to be excluded as the parasite was pathogenic for the dog. *T. pecorum* and *T. congolense* also appeared to be excluded as the parasite was found to be not pathogenic for the monkey, cat and rat.

Two cases of leishmaniasis were encountered, and *L. tropica* was found in preparations made from the boils. The author is inclined to think that the disease is more common than would appear from the fact that he found only two cases in two years, as there are many cases of chronic ulcers in which the parasite cannot be found, but which he thinks are due to Leishmania.

In two cases of splenomegaly spleen puncture was practised, but with negative results as regards the presence of Leishmania. No cases have been found in dogs.

About 80 per cent. of the blood smears examined contained malarial parasites, and in about 90 per cent. of cases the parasite was *Pl. praecox.*

Plasmodium kochi was found in one monkey out of about 30 kept under constant observation. Gametes were present in the blood of this animal daily for about three weeks prior to its death. For a period of five days terminating four days before death schizonts were also present.

Four other monkeys inoculated from it either before or at the time of death all failed to become infected.

A small outbreak of piroplasmosis occurred in a recently purchased herd of cattle, but it did not appear to spread to other animals mixed with them. At the time of death parasites were present in the blood in large numbers, but not more than two were found in a single corpuscle. The majority were elongated, with a speck of chromatin at one end.

Various forms of filariasis are encountered in the area.

Goitre is extremely common. In some of the villages near Goundi nearly 80 per cent. of the people are affected. Men, women and children are all affected, and even dogs, kids, and horses. The disease occurs at all seasons. The author has not been able to find any cause for its development. There is no evidence that it is hereditary.

LEISHMANIASIS.

(107) Laveran (A.). **Leishmaniose cutanée expérimentale chez les macaques et chez le chien. Conditions de l'immunité.** [Cutaneous Leishmaniasis in Monkeys and Dogs. The Production of Immunity.]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 265–275. With 1 plate.

The author has been able to infect monkeys with *L. tropica* with certainty by the following procedure. The skin on the outer side of the thigh is shaved and washed with hydrogen peroxide, and punctures are made obliquely through it with a vaccinostyle at a distance of at least one centimetre from each other. When bleeding has stopped a fragment of tissue taken from a mouse infected with the parasite is inserted into each of the punctures. When this plan is adopted the period of incubation is very short.

It has been found that recovery from infection produced in this way is sometimes followed by immunity. In dogs reinoculation after recovery from a primary infection is generally followed by a relapse, but the lesions produced are as a rule smaller and persist for a shorter length of time than those resulting from the primary inoculation.

Inoculations after recovery from a second infection are generally abortive, but it sometimes happens that positive results can be obtained when several months have elapsed since recovery from the second inoculation.

(108) Laveran (A.). **Infections expérimentales de la souris par la *Leishmania tropica*; un cas d'infection par la voie digestive.** [Experimental Infection of Mice with *Leishmania tropica*; a Case of Infection by the Digestive Tract.]—*C. R. Acad. Sci.* 1916. Jan. Vol. 162. pp. 187–190.

On six occasions during May and June 1915 the author introduced into the mouth of a white mouse four or five drops of culture of *L. tropica* obtained on simplified Novy medium. The material was introduced into the mouth by means of a glass pipette which was not allowed to come into contact with the mucous membrane.

Towards the end of January 1916 it was observed that the left tarso-metatarsal articulation was markedly swollen. The swelling was congested and painful, and caused lameness. A drop of serous liquid obtained from the joint with a pipette was found to contain enormous numbers of parasites, both free and included within cells.

The mouse was in a cage by itself and had no fleas on it.

At the time of writing no other lesions had made their appearance, but the author thinks it probable that the lesion will extend, that areas of gangrene of the skin will appear, and that, finally, the condition will become septicaemic as in the experimentally inoculated mice.

(109) Lignos (A.). **La Leishmaniose canine à Hydra.** [Canine Leishmaniasis in Hydra.]—*Bull. Soc. Path. Exot.* 1916. May. Vol. 9. No. 5. p. 302.

During the warm season (May to October) 1912 the author examined 48 dogs and found 16·6 per cent. infected.

During the cold season October 1914–April 1915, 78 dogs were examined and 8·9 per cent. of infected animals were found.

(110) Nicolle (C.). **Chronique du Kala-azar en Tunisie.** [Kala-azar in Tunis.]—*Bull. Soc. Path. Exot.* 1916. Mar. Vol. 9. No. 3. pp. 126–129. With 1 text-fig.

Since the last statistics were published in June 1914 the number of cases of the disease occurring among children has risen from 38 to 45. The seven children range from eight months to seven years old, and in six of the cases the parents are Italian.

It is observed that the majority of cases occur in children about three years old, that boys are more frequently affected than girls, and that more cases occur among the Italians than other races.

The author has four strains of *Leishmania donovani* in culture, all of which have passed through a hundred or more generations. Two are of human origin and were derived from children, and the other two are from naturally infected dogs. The author refers to these strains as varieties of *L. donovani*.

A strain of *L. tropica* became contaminated at the 135th generation, and was allowed to die out, but it was recovered from a man inoculated with it, and has since passed through 31 generations on NNN medium.

Attention is drawn to the occurrence of an anaemia associated with enlargement of the spleen which does not appear to be due to kala azar. Eight cases have been observed in Tunis during 1914 and 1915. All were in boys under six years of age.

Contrary to what appears to be the case with kala azar, the majority of cases of this disease were seen in children of races other than Italian.

The prognosis is more favourable than in kala azar, and the majority of cases recover.

SPIROCHAETOSIS.

(111) YAKIMOFF (W. L.), SCHOKHOR (N. J.) & KOSELKINE (P. M.). **Spirochétose des poules au Turkestan russe.** [Avian Spirochaetosis in Russian Turkestan.]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 227–228.

The authors briefly record the occurrence of spirochaetosis in fowls and state that they were able to transmit the infection by means of *Argas persicus*.

Intramuscular injections of atoxyl in doses ranging from 0·03 to 0·1 gramme according to the weight of the birds effected cures.

UNDULANT FEVER.

(112) LABONNOTTE (X.) & DELANOË (M. et Mme. P.). **Au sujet de la Fièvre ondulante à Mazagan.** [Undulant Fever at Mazagan.]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 207–211.

The authors record the occurrence of the first two cases of undulant fever at Mazagan, and draw attention to the fact that the goats which supply the town with milk come from Malaga (Spain), where the disease is endemic.

(113) NICOLLE (C.) & GOBERT (E.). **Nouvelle enquête sur les chèvres laitières de Tunis. Troisième Mémoire.** [Further Inquiry into the Milch Goats of Tunis. Third Memoir.]—*Arch. Inst. Pasteur Tunis.* 1916. Apr. Vol. 9. No. 3. pp. 157–175. With 1 map.

This paper has appeared in a somewhat shortened form in the *Bull. Soc. Path. Exot.*, 1916 Feb. Vol. 9, No. 2, of which an abstract is given on page 17 of Volume 4 of this *Bulletin*.

The present paper includes all that previously published, but in addition the texts of the regulations drawn up and the detailed distribution of the infected animals are given.

RINDERPEST.

(114) PIOT-BEY. **Immunisation du bétail égyptien contre la peste bovine par la méthode simultanée du sérum et du sang virulent. Durée de l'immunité.** [The Immunisation of Egyptian Cattle against Rinderpest by the Simultaneous Method with Serum and Virulent Blood. The Duration of the Immunity.—*Ann. Inst. Pasteur.* 1916. Apr. Vol. 30. No. 4. pp. 187–194.

The first attempt at carrying out active immunisation on a large scale was made at the commencement of the outbreak in 1903, which

carried off in less than a year more than a third of the cattle population of Egypt. This disastrous result was probably due to the inferior quality of the various sera used. Up to 1912 the serum alone method was exclusively employed. It was found however that the method was a failure, and on the State Domains considerable success was obtained in the control of the disease by the enforcement of isolation. While this was possible in the controlled areas, it was quite out of the question in other parts of the country, and there was every chance of the disease persisting indefinitely unless other measures could be resorted to.

The results obtained by GORDON at the Serum Institute proved that a valuable serum could be prepared, and it was tested on a herd of 52 animals in 1912. Each animal received 100 cc. of serum and 2 cc. of virulent blood. Twenty-eight of these animals gave marked reactions, and three of them showed, in addition, symptoms of piroplasmosis. One of the latter died.

A fortnight after the immunisation 30 animals taken indiscriminately from the whole herd were subjected to a test inoculation with 10 cc. of virulent blood. Not one reacted, thus proving that the vaccination had been effective, and that the animals which did not react to the vaccination already possessed an immunity to the disease.

In consequence of this good result the operation was undertaken on a large scale, and during the period June 1912 to February 1913, 1,958 animals were inoculated.

A practical test of the value of the immunity conferred by the method is that although the disease has made its appearance in the neighbourhood of State Farms on a number of occasions, not a single case has arisen among the vaccinated animals for more than three years. Further, when a severe outbreak occurred causing hundreds of deaths among outside animals, the vaccinated animals were lent to the farmers to enable them to work their cotton crops, and thus worked side by side with unprotected animals in heavily infected areas for more than a month, and not a single case of the disease occurred.

The immunity conferred by the vaccination was tested by inoculations with doses up to 10 cc. of virulent blood at intervals ranging up to three years after vaccination, and no reaction was produced in any. The number of animals tested in this way was 681.

Of 2,010 animals inoculated, two only have shown lesions suggestive of rinderpest, and in both cases their blood was proved to be inactive. Sixteen animals died of piroplasmosis, either of Texas fever, or of the Egyptian form of the disease. Three died of tuberculosis during the month following the inoculation. Four animals showed general paralysis or paraplegia, and one of these recovered. It is therefore seen that the losses following the vaccination, including all accidental losses, amounted only to about 1 per cent., and that piroplasmosis is the most serious of the complications.

At the suggestion of GAUTIER hypothermic (hypodermic ?) injections of arrhenal have been used for the treatment of cases of piroplasmosis, and it has been found possible to cure every case, provided intervention is possible on the first day of the disease, and that it is not complicated with any other disease.

On the results obtained with the domains cattle a systematic vaccination of the cattle in the different districts, beginning with the cotton areas, was authorised by the Government.

LITTLEWOOD's report shows that the mortality among 290,726 animals vaccinated amounted to 1·45 per cent.

FOOT AND MOUTH DISEASE.

(115) COSCO (G.) & AGUZZI (A.). **La virulenza del sangue degli animali malati di afta epizootica.** [The Virulence of the Blood of Animals infected with Foot and Mouth Disease.]—*Clinica Vet.* 1916. Apr. 15. Vol. 39. No. 7. pp. 193-195.

In this short paper the authors publish the conclusions drawn from a number of observations regarding the virulence of the blood of animals infected with foot and mouth disease. A full publication is promised at a later date.

The conclusions may be summarised as follows :—

The blood is virulent during the whole of the febrile period, and its virulence is greater than that of the liquid obtained from the lesions. Both serum and corpuscles inoculated separately are capable of producing the disease, and they appear to be of equal virulence. Defibrinated blood kept in an ice chest retains its virulence for a month or more. Under these conditions the corpuscles retain their virulence longer than serum.

One cubic centimetre of corpuscles that have been repeatedly washed with sterile physiological salt solution is capable of producing the disease by subcutaneous inoculation. A similar dose of serum is also capable of setting up infection.

The inoculation of bovines in series does not exalt the virulence of the virus.

Washed corpuscles administered by the mouth apparently fail to produce infection.

RABIES.

(116) KONRADI (D.). **Hérédité de la Rage. (Deuxième Note.)** [Transmission of Rabies by Heredity. (Second Note.)]—*Ann. Inst. Pasteur.* 1916. Jan. Vol. 30. No. 1. pp. 33-48.

The previous communications in connection with this subject were published by the author in 1904 and 1908. The present paper is published because since the latter date a number of authors have expressed views contrary to those held by Konradi, who brings forward further observations in support of his views.

In May 1909 a child which had been bitten died after having shown symptoms of rabies in the Pasteur Institute at Budapest. The author received some "virus" from this case in carbolised glycerin. The sterility of the virus was tested by sowing it on agar, and it was then used for the subdural inoculation of a rabbit. Two guinea-pigs were

also inoculated deeply beside the dorsal spine. The guinea-pigs died of rabies in 23 and 26 days. On the 12th and 13th days the rabbit showed an elevation of temperature, and after an interval of 20 days its temperature rose again. On the following day it gave birth to three young ones which died on the fourth day. The rabbit died of rabies thirteen months later. Negri bodies were not discoverable in the brains of the young rabbits, but all three were used for the subdural inoculation of rabbits and guinea-pigs.

One of the guinea-pigs died of rabies on the 23rd day. The rabbit inoculated from the same brain survived for fourteen months without showing symptoms and was then used for another experiment.

Similar results were obtained with the animals inoculated from the brain of the second young rabbit, the guinea-pig dying from rabies and the rabbit surviving for six months and then dying of another disease.

The guinea-pig inoculated from the third rabbit died on the 26th day of rabies, and the rabbit died on the 725th day. Numerous Negri bodies were found in its brain.

The brain of the guinea-pig inoculated from the second young rabbit was used for the further inoculation of a guinea-pig and a rabbit. The guinea-pig died on the 28th day, and it was noted that symptoms appeared only on the day before death. The guinea-pig from which it was inoculated showed symptoms for five days. The rabbit died on the 529th day.

The author publishes a number of observations on similar lines.

Special interest attaches to a case related by the author in which a dog in apparent good health bit a child. Eleven days later it bit another dog while it was under the author's observation. The following day it showed furious symptoms and died. It was subsequently learned that it had bitten another dog fourteen days before its death. This dog died while under the author's observation on the 39th day with all the characteristic symptoms of rabies.

Upon this evidence the author points out that it is an error to suppose that if a dog lives for ten days after biting some one there is no risk of rabies developing.

The author's conclusions may be summarised as follows :—

The virus of rabies is transmitted from mother to foetus, but if this occurs in series the virulence gradually diminishes. This appears to hold good for many species of animals :—dogs, rabbits, guinea-pigs, and probably other animals.

Guinea-pigs are preferable to rabbits for experiments of this kind, as they are more susceptible to rabies, and more rapid and certain results are thereby obtained. The late development of the disease in the rabbit probably explains the negative results obtained by other authors.

In any case the animals must be kept under observation for long periods.

The virus is present in the blood when the temperature rises. This is the first symptom in experimental rabies. The bites of dogs may be dangerous fourteen days before the appearance of clinical symptoms.

(117) Archives de l'Institut Pasteur de Tunis. 1916. Apr. Vol. 9. No. 3. pp. 201–204.—**Fonctionnement des Services de l'Institut Pasteur pendant l'année 1915 (Tunis). Service Antirabique.** [Anti-Rabic Treatment during 1915 in Tunis.]

The number of persons presenting themselves for treatment during the past year was 443 as compared with 403 during 1914.

In fifteen cases the treatment was not completed owing to discovery that the dog responsible for the bite was not affected with rabies, and in eight further instances the patients, for no apparent reason, did not have the complete course.

In five cases death occurred before the final inoculation was given. The people were either severely bitten or failed to come for treatment early enough. No deaths occurred among the remaining 415.

Since the establishment of the Institute 5,711 persons have been treated, and the mortality is 0·315 per cent.

Of the animals responsible for the bites 399 were dogs, 16 cats, three donkeys, one horse and one ox. In 199 cases the animals were domesticated and in 194 stray. But for the established fact that the disease is mainly kept alive among domesticated dogs it would be difficult to explain the higher figure among the domesticated animals.

In 102 cases experimental inoculation was resorted to for the establishment of a diagnosis, with positive results in 40 of these. In the remaining cases the animals were only suspect.

PROTOZOA.

(118) Porter (Annie). **The Occurrence of *Pneumocystis carinii* in Mice in England.**—*Parasitology.* 1916. Jan. Vol. 8. No. 3. pp. 255–259. With 8 text-figs.

After briefly summarising the observations that have been made in connection with the occurrence of protozoal cysts in the lungs of various animals and the errors that have been made in regarding these as stages in the development of trypanosomes, the author passes to a description of the parasite found in the lungs of a wild mouse killed at Cambridge.

The parasites were not found elsewhere than in the lungs. They were examined fresh and after intra-vitam staining with methylene blue.

The youngest phases were rounded bodies measuring about 5 microns with finely granular protoplasm and a single nucleus. They were either free or enclosed in endothelial cells. The cyst wall varied in thickness in different individuals. The older cysts showed phases of development into two, four and eight nuclei. By separation of the cytoplasm off around each of the nuclear fragments eight merozoites were formed. The mature cysts measured about 6·5 microns.

The vermicular merozoites measured from 1·5 to 2·5 microns in length by 0·5 in width. The free merozoites moved slowly, and rapidly became rounded.

The author thinks that the encysted parasites leave the host by way of the mucus in the oral or nasal secretions, and that the passage from host to host is probably by the contaminative or casual method.

The zoological position of the parasite is not yet established and no sexual forms have been discovered.

(119) Pearce (Louise). **Klossiella Infection of the Guinea-pig.**—*Jl. Experim. Med.* 1916. Apr. Vol. 23. No. 4. pp. 431–442. With 8 plates comprising 21 figs.

The author encountered this parasite while carrying out investigations regarding the effects produced by arsenical compounds on the kidneys. Examination of sixty animals obtained from Philadelphia and New Brunswick showed that 20 per cent. were infected.

The form of parasite most frequently encountered was a small round or ovoid body measuring about 7 microns in diameter and containing a number of pieces of chromatin scattered through its substance. These fragments are either large and irregular or mere specks. The parasites generally occur free in the lumen of the straight tubes in the inner part of the cortex, or less frequently in the convoluted tubes and Bowman's casule. That the parasites were originally enclosed in epithelial cells is shown by the fact that in many cases a thin limiting membrane composed of the remnants of the cell can be made out.

Each of these parasites divides into eight or twelve bodies which are falciform and surrounded by a distinct membrane. Each of these contains a single particle of chromatin.

The rounded bodies above referred to appear to be derived by a process of division from rounded structures of much larger size.

In another stage parasites measuring 18 to 20 microns in diameter are found enclosed in epithelial cells. These parasites are divided up into a number of segments which in sections appear to be arranged in a ring. Each segment contains one or two chromatin dots.

The individual segments of the ring forms appear to be ovoid in shape and to measure 5 to 8 microns in length by 3 to 5 in width. At one end there is a large mass of chromatin, and at the other an area that does not take any stain.

From appearances presented by the section it would appear that these bodies enter fresh epithelial cells.

In one kidney large parasites which appeared to be schizonts were found, the merozoites closely resembling the previously described falciform parasites which were considered to be sporozoites.

No gross lesions of invaded kidneys have been found, but the author is inclined to think that collections of fibroblasts found especially around the glomeruli may be due to the presence of the parasites in the organs. There appears, however, to be no reaction in the immediate neighbourhood of the parasite.

The author thinks that while the parasite here described resembles that described by Seidelin, in many respects it differs from it markedly, in that only eight to twelve sporozoites have been found whereas Seidelin found as many as thirty.

(120) Pettit (A.). **Sur un sporozoaire parasite du cobaye, appartenant au genre *Klossiella* Smith and Johnson.** [A Sporozoon of the Guinea-Pig belonging to the Genus *Klossiella* Smith and Johnson.]—*C. R. Soc. Biol.* 1916. Feb. 19. Vol. 79. No. 4. pp. 168–170.

This brief note contains a description of such forms of the parasite as the author was able to discover in the kidney of a single infected guinea-pig.

The parasites were found almost exclusively in the striated epithelial cells. The smallest forms were rounded bodies about 7 microns in diameter with fine basophil granules in their cytoplasm. The nucleus of the host cell shrinks, but the cytoplasm appears to form a kind of envelope for the parasite. Division occurs by a process of karyokinesis, and the daughter parasites arrange themselves at the periphery, leaving a central residual body. At this stage the parasite may measure 30 microns. The bodies produced by division are oval in shape and measure 10 microns.

No further stages of development were seen.

Very slight changes were produced in the invaded tissues apart from the lesions of the cells themselves. There was no production of inflammatory tissue.

The author draws attention to the fact that this parasite was first described by Pianese in 1901.

(121) Carini (A.). **Ueber die Hundekrankheit Nambi-uvu und ihren Parasiten.** [Nambi-uvu, a Disease of Dogs, and its Parasite.]—*Centralbl. f. Bakt.* 1 Abt. Orig. 1915. Dec. 29. Vol. 77. No 3. pp. 265–271. With 2 plates comprising 27 figs.

The disease known in Brazil as Nambi-uvu is responsible for considerable mortality among dogs, and especially among hounds. The name signifies bleeding from the ear, which is one of the commonest symptoms of the condition. The disease is also known as yellow fever on account of the frequency with which jaundice is a symptom.

Reference was made to the disease by the author in 1908 when he expressed the suspicion that it might be a piroplasmosis. Two years later the study of the disease was taken up by Rangel Pestana who discovered the causal organism and named it *Piroplasma vitalii*.

The disease occurs at all seasons of the year, but especially in the summer, and it mainly attacks dogs about a year old.

Three forms of the disease are recognisable. An acute form which runs a rapid course and is characterised by dullness and loss of appetite, unsteadiness of gait, irregularity of temperature, pronounced jaundice, progressive anaemia, and which terminates fatally in from three to ten days. A subacute form of which the principal symptom is haemorrhage from the skin of the ears, back or other part of the body. The dermatorrhagia is spontaneous and recurs at more or less regular intervals. Internal haemorrhage occurs and there is practically always enlargements of the lymphatic glands.

In the chronic form of the disease the symptoms are not at all characteristic, and clinical diagnosis is practically impossible. Loss of appetite, weakness, anaemia and progressive emaciation are observed. The majority of the chronic cases recover.

The disease is transmissible to dogs by all methods of inoculation, but not by ingestion. Inoculation generally results in the production of the acute form of the disease, the haemorrhagic form being rarely produced in this way, although that is the commonest form of the disease in natural cases.

In young puppies the period of incubation is from three to ten days and death is not long delayed.

When adult dogs are inoculated the result is either the production of the chronic form of the disease or the inoculation fails, probably owing to a previously acquired immunity. In these circumstances the period of incubation may be as long as 25 days. It varies with the virulence of the parasite and the susceptibility of the dog.

The parasites are usually very scantily present in the blood, and in some cases of a clinically identical disease they could not be discovered either in the original dogs or in young dogs inoculated from them. These facts suggest to the author that there may be two distinct diseases having similar clinical pictures but caused by different organisms.

The lesions, apart from those of jaundice, are enlargement and softening of the spleen. The kidneys are enlarged and show petechiae. The cortical portion of the adrenals is enlarged. The bone marrow is diffluent and of an intense red colour. The cause of the condition is a protozoal parasite which to some extent resembles *Piroplasma canis*, but differs from that organism in certain important characters.

The organism can be found in the blood in acute cases, particularly in the later stages, but it is exceptional to find it in large numbers. In less severe cases it may be quite impossible to find the parasite in the blood.

The parasites are intracorpuscular and range from 2 to 4·5 microns in diameter. In cases where they are numerously present in the blood autoagglutination of invaded cells may be observed. In stained preparations (Romanowsky) the cytoplasm stains blue and has an alveolar structure. The nucleus is compact, excentrically placed, and stains bright red.

The parasites vary somewhat in shape, appearing rounded, oval or pear-shaped. They frequently occur in pairs. Multiplication is by binary division, the nucleus dividing first. Multiple invasion of red corpuscles occurs.

In smear preparations from organs, and better still in sections, parasites undergoing schizogony can be found. These occur in connective tissue corpuscles and in endothelial cells. The multiplication by binary fission and by schizogony resembles that seen in Toxoplasma. The author holds that this parasite is distinguished from Piroplasma by the fact that in the latter multiplication by schizogony is never known to occur, and suggests that a new genus " Rangelia " should be made for it.

All attempts to cultivate the parasite have failed.

The parasite persists in the body for long periods after recovery has taken place.

As yet no positive results have been obtained in experiments to test the part played by ticks in the transmission of the disease, but the fact that it occurs more frequently in dogs in the country than in towns suggests that it may be tick transmitted.

Trypanblue has been used successfully in the treatment of the disease.

(122) Smith (T.). **Aberrant Intestinal Protozoan Parasites in the Turkey.**—*Jl. Experim. Med.* 1916. Mar. Vol. 23. No. 3. pp. 293–300. With 1 plate, comprising 4 figs.

The bird in which the parasite here described was found was about two months old when it was chloroformed to death on account of symptoms of dullness and loss of appetite. The disease under investigation at the time was the so-called blackhead, and the bird was destroyed with the object of obtaining fresh materials for examination as to the presence of the parasite that is responsible for that condition. No evidence of blackhead was found in it.

The bird had been raised along with several others in an incubator and a brooder on ground where no adult turkeys or poultry had been for several years.

Several coccidia measuring 24 by 17 microns were found in the faeces passed during the chloroforming. Subsequently examination of pieces of the intestine fixed in Zenker showed that peculiar bodies, which were taken to be asexual stages of a coccidium, were present in very large numbers in the subepithelial layer of the mucous membrane, while few were present in the epithelial layer.

The author refers to various publications in which the presence of coccidia in tissues other than epithelium has been described.

The degree of invasion appeared to be about the same in the upper, middle, and lower parts of the small intestine.

The epithelium was still present, but raised from the core of the villi, the intervening space being filled with what is described as "a network of circular lines of a precipitate made up of fine granules."

"The parasites were visible under a low power as vacuoles arranged in an almost continuous band near the margin of the villus core. Occasional bodies were nearer the central axis of the villus. Under high powers these vacuole-like bodies were found to be partially empty. A few were well filled. They consisted of some host cell whose cytoplasm had been moulded into a shell (or ring in section) with the much flattened nucleus against this shell. The contents were a very fine lining membrane within which were roundish bodies of various diameters, 2 microns or more, staining feebly reddish and with or without a mass of chromatin. Frequently a body contained two chromatin masses situated at opposite poles, as if division had taken place. Those bodies which were full of the small spheres, contained about 16 or more of more or less uniform size. The vacuolated appearance under the low power was due to the disappearance of some or all of the parasitic contents of the host cell. Prolonged search for the characteristic products of asexual multiplication—falciform bodies—brought to light only two or three parasites containing them. It is not to be denied that these may have been moulded into crescent shape by the pressure of the other growing and segmenting members in the same membrane."

From his examination of the material available the author is unable to say whether the parasite is one of the avian coccidia or a foreign organism which failed to survive in an accidental host.

In two small areas in the caeca of the bird the author discovered what appeared to be ordinary bird coccidia in large numbers in the epithelial cells.

The infection is possibly accounted for by the presence of pheasants and other birds around the experimental grounds.

(123) Carini (A.) & Maciel (J.). **Quelques hémoparasites du Brésil.** [Some Brazilian Haemoparasites.]—*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 247–265.

In this paper the authors describe a number of parasites found in blood smears made from birds. In nearly all cases dry films only were available for examination.

The parasites found include microfilariae, trypanosomes, halteridium, proteosoma, toxoplasma (haemogregarines ?).

HELMINTHS.

(124) Yakimoff (W. L.) & Collaborators. **Microfilaires des animaux au Turkestan russe.** [Animal Microfilariae in Russian Turkestan.] —*Bull. Soc. Path. Exot.* 1916. Apr. Vol. 9. No. 4. pp. 219–226. With 1 plate, comprising 5 figs.

Microfilariae of donkeys.—Parasites have been found in the blood of 19 donkeys out of 847 examined, and the author considers it probable that the species is the same as that occurring in horses in the same area.

Differential counts of the leucocytes in the blood of seven animals from different districts showed that, as in the horse, there was often marked eosinophilia.

Only 46 mules were available for examination, and in one of these microfilariae, also apparently identical with those found in the horse, were discovered.

Microfilariae in Camels.—Of a total number of 1,306 camels examined 117 were found to be infected. The percentage of infected animals varied considerably in different districts, the maximum of 22·5 occurred in the Merve area and the minimum of 0·94 in Taschkent.

Excluding the sheath the parasites ranged from 184 to 226 microns in length. They showed four clear areas.

In addition to the embryos, first stage larvae were often found in which evidence of the differentiation of the alimentary canal could be made out.

Comparative differential leucocyte counts of infected and uninfected camels appeared to indicate that a similar degree of eosinophilia may occur in both, but the possibility is suggested that though microfilariae were absent from the blood other helminths might be responsible for the condition. Comparisons of the measurements given by other authors of microfilariae found in the blood of camels show that the parasite occurring in Turkestan is almost certainly identical with *Microfilaria camelensis* Balfour.

(125) Bouilliez (M.). **Sur une Filaire du Crapaud de la région du Chari.** [A Filaria of the Toad in the Shari Area.]—*Bull. Soc. Path. Exot.* 1916. Mar. Vol. 9. No. 3. pp. 133–137.

The microfilaria described in this paper has been found by the author on a number of occasions in the blood of the common species of toad

occurring in the Shari area, which he believes to be *Bufo regularis*. He has also been able to find the adult form of the parasite in the peritoneal cavity.

The adult worm is whitish and transparent in the fresh state, and is of practically the same thickness throughout its length. There is no transverse striation, but at places an appearance of longitudinal striation can be made out. The anterior extremity is only slightly attenuated, and shows no papillae. In both sexes the posterior extremity terminates in a blunt point.

The oesophagus is composed of two parts. The first portion is short and narrow and fairly transparent. The second portion is much longer and wider and has a glandular appearance. The intestine is wider than the oesophagus. The excretory pore and the nerve ring have not been definitely localised.

The male is about 30 mm. in length by 170 microns in thickness. The posterior extremity is curved. There are five pairs of genital papillae; three of these are just posterior to the cloaca which is situated 68 microns from the posterior end. The two spicules are unequal in length. The longer is slender and striated at its proximal end as if enclosed in a wrinkled sheath. It terminates in a fine point and appears to have a recurved barb. The shorter one is much thicker and has a thickening at the proximal end shaped much like a human foot. The short spicule is about 125 microns in length, and the long one about three times that length.

The female is nearly twice the size of the male. The tail is rather more slender and not so curved. The anus is situated 275 microns from the posterior end, and the vulva 1·3 mm. from the anterior end. The genital tubes are closely wound round the intestine. The uterus is filled with eggs in various stages of development, the most mature ones measuring 34 microns in length by 30 in width. In preserved material free embryos may be found in the uterus.

The adult parasite has been found in the peritoneal cavity only, and in one instance two of the parasites were found attached to the liver.

Of 62 toads examined only five contained parasites, and seven or eight adults were found in each.

The microfilariae are always numerously present in the blood, and although they are actively motile they do not move about the field. There is apparently no periodicity in the movement.

The parasites measure on an average 150 microns in length by 7 microns in width.

The anterior end of the body appears to be flattened and covered with a thickened cuticle which is very finely denticulated posteriorly. Behind this there is a slight constriction. The caudal extremity although somewhat drawn out does not terminate in an actual point. No striation of the body can be detected, and the sheath of the parasite is very difficult to make out. It appears to be very closely moulded on the parasite.

In stained preparations the column of nuclei is found to be broken at the anterior and the posterior thirds, the other break occurring at the posterior fourth.

(126) Railliet (A.). **Sur les Filaires de Batraciens.** [The Filariae of Reptiles.]—*Bull. Soc. Path. Exot.* 1916. Mar. Vol. 9. No. 3. pp. 137–140.

In this paper the author summarises the Filariae and associated worms that have been described as occurring in reptiles, and comes to the conclusion that the parasite described by Bouilliez (see Abstract No. 125) is probably *F. leiperi.*

Attention is drawn to the fact that whereas this worm has previously been described as occurring in connective tissues, Bouilliez found his parasites in the peritoneal cavity only. This is not considered sufficient to render the classification incorrect.

The arrangement of the genital papillae is said to justify the worm being taken out of the genus Filaria and placing it in a genus of which *F. neglecta* is possibly the type.

(127) Leiper (R. T.). **On the Relation between the Terminal-Spined and Lateral-Spined Eggs of Bilharzia.**—*Brit. Med. Jl.* 1916. Mar. 18. p. 411.

This short note is published by the author because of the probable delay in the publication of the final portion of his report owing to his absence abroad.

The two principal theories that have been brought forward to explain the occurrence of Bilharzia eggs with the spines in different positions are :—

(*a*). The terminal-spined eggs are the normal eggs laid by impregnated females, and the lateral-spined eggs are those produced by parthenogenesis (Looss).

(*b*). The constant and peculiar shape of the lateral-spined eggs, their incidence, and their special selection for the intestinal tract, suggest a zoological distinction between the adult worms (Manson).

Experiments with mice showed that the eggs with terminal spines were always produced by adults developing from cercariae derived from *Bullinus contortus* and *B. dybowski*, while lateral-spined eggs were always obtained from parasites developing in *Planorbis boissyi.*

The cercariae from the two sources showed small differences in the suckers, the relative length of the tail, and other minute points. Similar differences were found in the adults.

The worms derived from Bullinus have four or five large testes and the lateral gut branches are late in uniting. In the female the ovary lies in the posterior half of the body, the uterus is long and voluminous and contains many eggs with terminal spines.

In worms derived from *Planorbis boissyi* the males are small and have eight small round testes. The lateral gut branches unite early. In the female the ovary is in the anterior part of the body, the uterus is short and generally contains only one egg at a time. The eggs always have a lateral spine.

BITING FLIES AND TICKS.

(128) JOHNSTON (J. E. L.). **A Summary of an Entomological Survey of Kaduna District, Northern Nigeria.**—*Bull. Entom. Res.* 1916. May. Vol. 7. No. 1. pp. 19–28. With 2 sketch maps.

The author started his survey of the district in August 1914, but was unfortunate in encountering unusual weather conditions. The rainfall was very much below that for the previous year, and this probably accounted for the small number of flies found.

During the whole tour only three tsetse-flies were caught, one *G. tachinoides*, and two *G. palpalis*. It is probable that when the rainfall is heavy the flies come up from the lower parts of the river.

Blood films were made from 150 head of cattle, and 19 were found to be infected with trypanosomes, the parasite present in most of the cases being of the *vivax* type. Thirty-nine animals showed piroplasms in their blood. These were very variable in size. "Some were large pyriform bodies, often with two chromatin dots, or several chromatic granules; some were rings, sometimes extremely minute, sometimes fairly large, showing well-marked chromatin. Occasionally there was a large, more or less confused mass of protoplasm and chromatin, which in some instances could be seen to consist of more than one parasite. Bacillary forms were common, as were thicker forms intermediate between the bacillary and the ring-shaped types. These various types were occasionally seen in one film."

One sheep out of 12 examined showed piroplasms in its blood, but none were found to be infected with trypanosomes.

The paper contains a list of flies and ticks obtained.

(129) MACGREGOR (M. E.). **Resistance of the Eggs of *Stegomyia fasciata* (*Aedes calopus*) to Conditions Adverse to Development.**—*Bull. Entom. Res.* 1916. May. Vol. 7. No. 1. pp. 81-85. With 3 text-figs.

In this paper the author details experiments designed to ascertain the conditions under which the eggs of *Stegomyia fasciata* acquire a power of resistance which enables them to remain viable for periods amounting to months.

It was found in the earlier experiments that if eggs laid under conditions supplying plenty of moisture are removed from those conditions within a short time prompt shrinkage takes place and the embryos die. On the other hand it was found that if the eggs are left in contact with moisture for progressively longer periods before they are removed and allowed to become dry a progressively greater number of them remain viable, and that if the eggs are allowed to remain in contact with water for 60 hours or more all the eggs will hatch even after they have been allowed to become thoroughly desiccated.

MISCELLANEOUS.

(130) Dodd (S.). **Trefoil Dermatitis, or the Sensitisation of Unpigmented Skin to the Sun's Rays by the Ingestion of Trefoil.**—*Jl. Comp. Path. & Therap.* 1916. Mar. Vol. 29. No. 1. pp. 47–62.

The condition described in this paper has been known for some years in certain parts of New South Wales where it has been recognised under the name Aphis disease.

The following are the principal features of the condition. The disease occurs mainly in the spring (August, September and October), when aphides and trefoil are as a rule both abundant. Cattle, sheep, and horses may be affected, but it is only animals in trefoil paddocks that are attacked.

The condition appears in sheep soon after shearing, and the parts affected are the back and loins, ears and nose. Horses and cattle develop the lesions on unpigmented areas of skin only.

The symptoms are: Swelling of the skin with reddening and exudation, irritation resulting in biting and rubbing which lead to the production of raw surfaces.

Although it was a very firmly held opinion that the cause of the disease was aphides, no evidence could be obtained that any one had even seen animals attacked by them. No lesions were ever seen except those involving unpigmented areas of skin, and protection of such areas from sunlight prevented the development of lesions. In some cases in young lambs necrosis of the ears occurred.

The first experiments were carried out with common trefoil, *Medicago denticulata*. Fresh supplies of the plant were obtained and after examination as to freedom from admixture with other plants and fungus of any kind it was used for feeding experiments with guinea-pigs. Three series of experiments were carried out. In the first series guinea-pigs were fed with the plant and exposed to the sun. In the second the feeding was identical, but the guinea-pigs were protected from the sun. In the third the animals were fed upon their ordinary diet and exposed to the sun.

The guinea-pigs of the first group developed erythema of the skin associated with swelling, exudation, and pruritus. In two animals there was necrosis of the ears. The irritation of the skin appeared to be less during the night, but it returned when exposure to sunlight was repeated. Only unpigmented skin was involved, and even this escaped when it was covered with a thick layer of hair.

The symptoms appeared about the sixth day after the commencement of the experiment, and after the trefoil diet was stopped they disappeared slowly at first and then more rapidly.

The guinea-pigs fed upon the same diet, but protected from the direct rays of the sun developed no lesions, nor were any developed in those animals which were fed on their ordinary diet and exposed to the direct rays of the sun.

A similar condition to that above described is produced by the ingestion of buckwheat under the same conditions. It is thought that the green flowering plant is the most active in this connection, but the condition may also be produced by the ingestion of the grain, straw, chaff, or bran.

In this case the exposure to the sun need not occur immediately after the ingestion of the buckwheat, as the skin lesions may develop three or four weeks after plentiful feeding upon the plant.

Preliminary extraction of the buckwheat with alcohol prevents the development of the condition, and the extract obtained produces it.

It appears to be probable that a toxin is responsible for the lesions, especially as brain symptoms are often observed.

In severe cases death may occur in twelve hours or even less.

This condition is termed fagopyrismus.

Reference is also made by the author to the occurrence of the so-called clover disease, which has been recorded in Europe, but apparently not elsewhere.

(131) Cleland (J. B.). **Experimental Feeding with some Alleged Poison Plants of New South Wales.**—*Agric. Gaz. of N. S. W.* 1914. Jan. 2. pp. 65–69. (Published under the Title Miscellaneous Publication. No. 1714.) 1914. Sydney: Government Printer.

This short paper contains a summary of some experiments carried out with certain plants considered to be poisonous to animals, but it is pointed out that while in some cases negative results were obtained in the experiments it must not be assumed that the plants will not produce toxic effects under other conditions.

Dilleniaceae. *Hibbertia diffusa.*—

This plant was left untouched by rabbits in a rabbit paddock and was therefore suspected. A sheep was given amounts of 2 to 6 ounces almost daily for three months without any ill effects being noted, but it appeared to be invariably fatal to rabbits.

Euphorbiaceae. *Omalanthus populifolius*—Native Poplar.—

This plant has been credited with causing redwater.

A calf was given from 10 to 24 ounces daily of fresh leaves, cut up and mixed with other foods for four months without any ill effects being produced.

Leguminosae. *Indigofera australis.*—

This plant has also been credited with causing South Coast redwater in cattle. A calf which was fed almost daily with from 6 to 30 ounces of the leaves showed no ill effects. It is pointed out that occasionally the plant may contain hydrocyanic acid, but it seems certain that it does not contain any other definitely poisonous body in a sufficient amount to cause symptoms.

Santalaceae. *Exocarpus cupressiformis*—Native cherry.—

A sheep fed with the branches of this plant for a period of three months failed to develop any symptoms of cerebral disturbance which the plant has been credited with causing in horses.

Cucurbitaceae. *Cucumis myriocarpus*—Small Wild Melon.—

The repeated administration of a hundred of these fruit to a calf failed to cause any ill effects. The plant is said to have been responsible for blindness in horses in the western parts of New South Wales.

Lobeliaceae. *Lobelia purpurascens.*—

Three rabbits were fed upon this plant, and two of them died. The circumstances suggested that the deaths were not attributable to the plant, especially as one of them ate about three ounces daily for three months without any ill effect.

Cycadeae. *Macrozamia spiralis.*—

Numerous references have been made to this plant as a cause of rickets, and some years ago STEWART claimed to have produced the disease by feeding about two pounds daily to cattle.

A cow was given one pound of cut up leaflets together with nourishing food for six months. No evidence of disease was produced. The author thinks that in very poor country cattle may eat the plant, and that any symptoms produced are not due to the plant but to some deficiency in the diet which is little more than sufficient to prevent star ation.

Liliaceae. *Xanthorrhoea* sp.—Grass-tree.—

This plant was at one time thought to be responsible for unthriftiness and, eventually, paralysis, the symptoms being caused by a resin contained in the young shoots, which appeared to be especially dangerous after rain.

A calf which was fed almost daily for five months with from one to two pounds of young shoots and flowering stems failed to develop any signs of the disease.

(132) CROPPER (J. W.) & DREW (A. H.). **The Occurrence of Bodies resembling "Seidelin Bodies" (*Paraplasma flavigenum?*) in Anaemic and Foetal Blood, with Some Remarks on their Probable Nature.**—*Jl. Trop. Med. & Hyg.* 1916. Jan. 15. Vol. 19. No. 2. pp. 20–24. With 1 plate, comprising 25 figs.

Conclusions:—

"(1) The blood in pernicious anaemia and that of the human foetus and of new-born kittens contains bodies which appear identical with Seidelin bodies (*Paraplasma flavigenum*, the so-called parasite of yellow fever).

"(2) The bodies are apparently absent in the blood of normal and ordinarily anaemic adults. They may rarely be found in the blood of anaemic children.

"(3) The bodies are the remnants of the nuclear degeneration (Schilling-Torgau) which takes place in the conversion of the erythroblast into the normal non-nucleated red corpuscle.

"(4) The red-staining granules are readily demonstrated by the jelly method of *in vitro* staining and are probably centrosomes."

(133) ROUS (P.) & TURNER (J. R.). **The Preservation of Living Red Blood Cells in Vitro. I. Methods of Preservation.**—*Jl. Experim. Med.* 1916. Feb. Vol. 23. No. 2. pp. 219–237.

Apart from the theoretical interest attaching to experiments designed to perfect methods of preserving living red corpuscles in vitro, the authors point out that such methods might be of considerable practical value, as they could be used for serum reactions, culture media, and even for transfusion.

The authors detail the experiments carried out in connection with the causes of haemolysis occurring in corpuscles washed in the ordinary way, and methods of preventing this. They also deal with procedures devised for the preservation of such corpuscles outside the body so that they retain their physiological characters.

The results are summarised as follows :—

"The erythrocytes of some species are much damaged when handled in salt solutions, as in washing with the centrifuge after the ordinary method. The injury is mechanical in character. It may express itself in hemolysis only after the cells have been kept for some days. It is greatest in the case of dog corpuscles, and well marked with sheep and rabbit cells. The fragility of the red cells, as indicated by washing or shaking them in salt solution is different, not only for different species, but for different individuals. It varies independently of the resistance to hypotonic solutions.

"The protection of fragile erythrocytes during washing is essential if they are to be preserved *in vitro* for any considerable time. The addition of a little gelatin ($\frac{1}{8}$ per cent.) to the wash fluid suffices for this purpose, and by its use the period of survival in salt solutions of washed rabbit, sheep, and dog cells is greatly prolonged. Plasma, like gelatin, has marked protective properties.

"Though gelatin acts as a protective for red cells it is not preservative of them in the real sense. Cells do not last longer when it is added to the fluids in which they are kept. Locke's solution, though better probably than Ringer's solution, or a sodium chloride solution, as a medium in which to keep red cells, is ultimately harmful. The addition of innocuous colloids does not improve it. But the sugars, especially dextrose and saccharose, have a remarkable power to prevent its injurious action, and they possess, in addition, preservative qualities. Cells washed in gelatin-Locke's and placed in a mixture of Locke's solution with an isotonic, watery solution of a sugar remain intact for a long time,—nearly two months in the case of sheep cells. The kept cells go easily into suspension free of clumps, they pass readily through paper filters, take up and give off oxygen, and when used for the Wassermann reaction behave exactly as do fresh cells of the same individual. The best preservative solutions are approximately isotonic with the blood serum. If the cells are to be much handled gelatin should be present, for the sugars do not protect against mechanical injury.

"Different preservative mixtures are required for the cells of different species. Dog cells last longest in fluids containing dextrin as well as a sugar. The mixture best for red cells is not necessarily best for leukocytes.

"A simple and practical method of keeping rabbit and human erythrocytes is in citrated whole blood to which sugar solution is added. In citrated blood, as such, human red cells tend to break down rather rapidly, no matter what the proportion of citrate. Hemolysis is well marked after little more than a week. But in a mixture of three parts of human blood, two parts of isotonic citrate solution (3·8 per cent. sodium citrate in water), and five parts of isotonic dextrose solution (5·4 per cent. dextrose in water), the cells remain intact for about four weeks. Rabbit red cells can be kept for more than three weeks in citrated blood; and the addition of sugar lengthens the preservation only a little. The results differ strikingly with the amount of citrate employed. Hemolysis occurs relatively early when the smallest quantity is used that will prevent clotting. The optimum mixture has three parts of rabbit blood to two of isotonic citrate solution.

"In the second part of this paper experiments are detailed which prove that cells preserved by the methods here recorded function excellently when reintroduced into the body."

(134) Rous (P.) & Turner (J. R.). **The Preservation of Living Red Blood Cells in Vitro. II. The Transfusion of Kept Cells.**—*Jl. Experim. Med.* 1916. Feb. Vol. 23. No. 2. pp. 239–248.

Summary :—

"In order to determine the availability for functional uses of red cells kept *in vitro* by our methods, transfusion experiments have been carried out with rabbits by which a large part of their blood was replaced with kept rabbit cells suspended in Locke's solution. It has been found that erythrocytes preserved in mixtures of blood, sodium citrate, saccharose,

and water for 14 days, and used to replace normal blood, will remain in circulation and function so well that the animal shows no disturbance, and the blood count, hemoglobin, and percentage of reticulated red cells remain unvaried. Cells kept for longer periods, though intact and apparently unchanged when transfused, soon leave the circulation. Animals in which this disappearance of cells is taking place on a large scale, remain healthy save for the progressing anaemia. The experiments prove that, in the exsanguinated rabbit at least, transfusions of cells kept for a long time *in vitro* may be used to replace the blood lost, and that when the cells have been kept too long but are still intact they are disposed of without harm. The indications are that kept human cells could be profitably employed in the same way.' '

(135) Futaki (K.), Takaki (F.), Taniguchi (T) & Osumi (S.). The **Cause of Rat-Bite Fever.**—*Jl. Experim. Med.* 1916. Feb. Vol. 23. No. 2. pp. 249–250. With 1 plate.

The authors have encountered four cases of the disease, and in two of them have been able to make detailed investigations.

All the cases presented symptoms which are typical of the disease. The period of incubation is from 10 to 27 days, and the first symptoms are fever and headache. Inflammation occurs around the bites, pains occur in the limbs, a dark red skin eruption appears, and there is swelling of the lymphatic glands. The high fever and the local lesions continue for from three to seven days, and alternate with afebrile intervals of two to three days.

A piece of skin was obtained with precautions to ensure sterility from the first case investigated, and with dark ground illumination spirochaetes were discovered. Monkeys, guinea-pigs, and white rats inoculated with materials from the tissues and with blood all became infected.

Indian ink preparations of gland juice from the second patient and a piece of gland impregnated with silver nitrate also showed spirochaetes.

The parasite was larger than *Sp. pallida*, and smaller than the parasites of relapsing fever.

The patients were treated with mercury and salvarsan respectively and both recovered.

The conclusion drawn is that the organism is probably the cause of the condition.

(136) Tribondeau (L.), Fichet (M.) & Dubreuil (J.). **Procédé de coloration des liquides organiques et leurs parasites.** [A Method of Staining Organic Liquids and Parasites contained in them.]—*C.R. Soc. Biol.* 1916. Apr. 1. Vol. 79. No. 7. pp. 282–287.

This paper contains directions for the preparation and use of a compound dye the component parts of which are all of French manufacture. The method is based upon the use of eosinate of silver, methylene blue and eosinate of ordinary methylene blue.

(137) Muir (R.). **Staining of Bacterial Capsules in Films and Sections.**—*Jl. Path. & Bact.* 1916. Jan. Vol. 20. No. 3. pp. 257–259. With 1 plate, comprising 2 figs.

It is claimed for the method described in this paper that the capsules of bacteria can be differentially stained while a Gram-positive reaction is also obtained. Close adherence to the steps is enjoined.

Method applied to film preparations :—

(*a*). Dry film.—A thin film of the material is made on a cover glass and after becoming dry in the air it is fixed by placing in saturated watery sublimate solution for one minute. The preparation is then washed in water and in methylated spirit. (*b*). Wet film.—A cover glass carrying a thin moist film is placed film side downwards in 10 per cent. formalin for two to five minutes. It is then gently washed with water and methylated spirit.

The film is covered with freshly prepared Gram's stain of the following composition :—

Saturated alcoholic gentian violet	.. ..	1 part.
5 per cent. watery carbolic acid	.. ..	5 parts.

The preparation is heated gently over a Bunsen for a few minutes. When cool the stain is washed off with Gram's iodine and a little fresh iodine solution is added. After two or three minutes the iodine is washed off with methylated spirit and the washing with spirit is repeated.

A few drops of clove oil are then placed on the film and the warming is repeated. Wash with spirit and then with water.

Filter on the film a few drops of a solution containing one part each of a saturated watery solution of sublimate, a saturated watery solution of potash alum, and a 20 per cent. solution of tarnic acid. This is allowed to act for five minutes. Wash in water and counterstain for one or two minutes with a saturated watery solution of eosin. Wash in water. Filter on a few drops of saturated watery solution of potash alum and allow to act for a minute. Then wash, dry, and mount, or, in the case of wet-fixed films, dehydrate, clear in benzol, and mount.

Method applied to sections.—Small pieces of tissue should be fixed in 5-10 per cent. formalin for two or three days, and after a few minutes washing should be transferred to methylated spirit for two or three days to complete the hardening.

For the removal of the precipitate which frequently forms in formalin fixed material the pieces should be placed in a solution containing one part of 1 per cent. watery caustic potash and 20 parts of 80 per cent. alcohol. The removal of the precipitate is slow and requires a week or more.

Thoroughly wash for several hours in running water, and replace in methylated spirit where the pieces may be kept until required. Embed the tissues in the usual way.

The method of staining sections is identical with that described for films except that the specimen may not require heating after the clove oil is placed upon it, and in any case heating need not be prolonged beyond a few seconds in order to complete the decolourisation, and that the alcohol used for the dehydration should contain four drops of glacial acetic acid to the ounce.

(138) Krauss (W.) & Fleming (J. S.). **A Concentration Method for the Diagnosis of Malaria.**—*Southern Med. Jl.* 1916. Feb. Vol. 9. No. 2. pp. 141–144.

For the method described in this paper it is claimed that it can be used by the general practitioner and by the field worker, greater

concentration is obtained than by other methods, practically all the cellular elements are removed, and the parasites are well preserved and stain well.

For taking the blood sterile bottles with rubber stoppers and of about 30 cc. capacity have placed in them about 20 cc. of ·85 per cent. salt solution containing 2 per cent. sodium citrate. A 2 cc. syringe is first charged with 0·5 cc. of this solution, and is then filled with blood from a vein. The contents are then ejected into one of the bottles.

Formalin is then added to the mixture. A series of charts shows the effects both with regard to haemolysis and fixation of the parasites produced by various concentrations of formalin acting for different lengths of time. If the fixation be too rapidly carried out haemolysis may be prevented. The quantity of formalin added apparently depends upon the time that will elapse before the specimen is examined; the longer the time the smaller the amount of formalin required. The liquid is then centrifuged until all the cells are thrown down. The supernatant liquid and the leucocyte cream are removed. Distilled water is introduced into the tube and the cells are haemolysed. After further centrifuging smears are made of the deposit and stained. It is recommended that if commercial formalin is used it should be carefully neutralised with sodium hydrate. Similarly the reaction of the citrate solution may have to be corrected. This is done to avoid rewashing which is a cause of failure.

As a guide to the amount of formalin required it is said that if the blood is to be sent from a distance it is as well to add such an amount of formalin as will fix the parasites in from 24 to 48 hours, i.e., by adding two drops of 10 per cent. formalin solution (37 per cent. formaldehyde) to every 10 cc. of citrated blood.

The method of staining advised is not specified in this paper.

(139) Retterer (Éd.) & Neuville (H.). **De la rate des Camélidés, des Girafidés, et des Cervidés.** [The Spleen of the Camelidae, the Girafidae, and the Cervidae.]—*C. R. Soc. Biol.* 1916. Feb. 5. **Vol. 79. No. 3. pp. 128–131.**

The Camelidae.—

Llama guanaco.—The spleen is crescent-shaped, measuring about 17 centimetres in length. The right extremity is about 6 centimetres wide, and the left about half that. The left and hinder border is the convex one. The external surface is convex, and is not attached to the diaphragm in any way.

The spleens of the llama (*Auchenia glama*) and the alpaca (*Auchenia paco*) closely resemble that above described.

In the camel (*Camelus bactrianus*) when about one month old the spleen very much resembles that of the llama in general form, but is about twice as wide as its extremities. The borders may show superficial clefts.

The Girafidae.—In the giraffe (*Giraffa camelopardalis*) the spleen when in position is somewhat bell- or dome-shaped. The concave surface encloses the highest part of the rumen, and the convex surface engages with the diaphragm. Although the animal whose spleen was examined had not attained its full growth the spleen measured 35 centimetres in length, 20 in width, and had a maximum thickness of 7 centimetres.

The diaphragmatic surface of the organ is adherent to the diaphragm for at least half its extent, the only free portions being the left extremity and the ventral portion. On the visceral surface the spleen is attached to the stomach over the right two-thirds of its area.

Tragulidae. *Tragulus meminna* Erxl.—The spleen of the adult is practically oval in shape and measures 5 centimetres in length by 2 in width. Its right extremity is pointed, and the organ is thickest at its dorsal edge where the thickness is about 4 mm.

Cervidae. *Cervus axis* Erxl.—The spleen is flattened and measures about 4 centimetres by 2·5. The left extremity is pointed. The diaphragmatic surface is attached to the diaphragm in the dorsal third, but the right extremity is quite free. The visceral surface is connected to the stomach by dense connective tissue.

Cervulus muntjac Zimm.—The spleen is 8 centimetres long and 4 wide. The left extremity is narrower than the right. Both the borders are convex, and the splenic artery and vein enter and leave the organ at a prominence situated about the middle of the dorsal edge. The spleen is attached to the diaphragm over half the parietal surface and to the stomach over the dorsal third of its visceral surface.

Cervus capreolus L.—The spleen of a still-born subject was found to be 2 centimetres in length and 1·3 in width.

(140) Chatton (E.) & Blanc (G.). *Cryptoplasma rhipicephali* **n. g., n. sp., protiste endoparasite de la Tique,** *Rhipicephalus sanguineus,* **du Gondi :** *Ctenodactylus gundi.* [*Cryptoplasma rhipicephali* n. g., n. sp., Endoparasitic Protozoon of *Rhipicephalus sanguineus* from the Gondi.]—*C. R. Soc. Biol.* 1916. Feb. 5. Vol. 79. No. 3. pp. 134–138. With 2 text-figs.

The authors have found the parasite described in this paper in stained preparations made from a single nymph only out of about 100 examined. They have not observed it in the living condition, nor have they been able to determine in what organ or organs of the tick the parasite occurred. But the number of parasites found was so great that probably only the body cavity or a greatly distended intestine could have been capable of containing them.

All the parasites found were morphologically the same. They were slightly bowed structures about 55 microns in length and 5 in diameter at the thickest part, which was quite close to one end. One end was generally more pointed than the other. The body appeared to be quite unstained, but there was a fibrillated band of chromatin-like substance which made one spiral twist apparently around the outside of the body. The outer surface was quite smooth.

At the edges of the smears there were certain parasites which through rapid drying had undergone shrinkage which seemed to have resulted in the rupture of the wall, resulting in penetration of the stains. In these parasites the cytoplasm was coarsely granular, the granules in some cases being arranged in spiral coils. No nuclear structure could be definitely made out.

In some of the shrunken parasites it could be clearly made out that the chromophile spiral already referred to was closely applied to the outside of the unstained shell-like structure which enclosed the cytoplasm.

The authors suggest that the elongated structure represents a parasite, and the outer spiral of chromatin-like material represents the remains of the nucleus of a host well. In support of this view they give a figure of a haemogregarine of the gecko (which is probably a new species) enclosed in the remains of a red corpuscle.

With regard to the apparent absence of a nucleus in the parasite, two suggestions are put forward. One is that the thickness of the shell prevents it from staining by the technique employed, and the other is that the nucleus is diffuse as in the Cyanophyceae.

The authors have not sufficient material upon which to base any idea of the classification of the parasite observed, but they are inclined to exclude it as a stage of *Piroplasma quadrigeminum* or *Toxoplasma gondii*.

(141) Chatton (E.) & Blanc (G.). **Un pseudo-parasite *Cryptoplasma rhipicephali* Chatton et Blanc.** [A Pseudo-Parasite *Cryptoplasma rhipicephali*.]—*C. R. Soc. Biol.* 1916. May 20. Vol. 79. No. 10. pp. 402.

In the above journal of the date January 22, 1916, the authors published an account of an organism which they had found in immense numbers in the body of a tick, *R. sanguineus*. Only a single tick was found to contain the organisms and only a stained preparation was available for examination. According to the records the tick in which they were found was a nymph, and it is noted that the description was written eighteen months after circumstances had compelled the authors to stop their investigations. Apparently an error had crept into the records with regard to the stage of the tick in which the structures were found, as subsequent investigations carried out with male ticks shewed that the bodies were in reality spermatozoa, and that therefore the tick originally examined must have been a male.

REPORTS.

(142) Accra Laboratory. **Annual Report for 1914.** [Macfie (J. W. Scott).] 56 pp. F'cap. Illustrated. 1915. London: J. & A. Churchill, 7, Great Marlborough Street. [Price 5*s*.]

In referring to a number of abnormalities observed in blood films on different occasions the author states that in a number of tame mice brought from England all of which died soon after arrival, the only constantly observed phenomenon was the presence of immense numbers of platelets in the blood.

In the blood of cattle and sheep platelets sometimes presented extraordinary shapes. Some were like spirochaetes with a thickening in the centre.

It is stated that anaplasma-like bodies were very frequently found in the blood of men and animals. While such bodies were not specially sought for a note was kept of the number of smears in which they were present in conspicuous numbers. Except in the case of the pig, in which they were present in 33 per cent. of the samples of blood examined, no idea as to the frequency of occurrence in other species can be formed, as only the number of smears containing them is given, without the total number examined. In addition to cattle, humped and straight-backed, sheep, pigs, and goats, monkeys, bats, donkeys, hedgehogs, cats, brown, black and pouched rats, mice, and guinea-pigs also showed them in their blood.

A coarse basophilia of the red cells was a marked feature of the blood of cattle, especially those infected with trypanosomes.

Trypanosomiasis and piroplasmosis are dealt with, but these subjects have received a more extended notice in a paper published in the *Ann. Trop. Med. & Parasitol.*, 1915. Dec. [see this *Bulletin*, Vol. 4, No. 1, pp. 6–9].

Spirochaetes were found on a number of occasions in blood films from cattle, sheep, pigs, and goats, but as the films were made at the slaughter-house the possibility is not excluded that some of them were contaminated.

The parasites found appeared to fall into four groups.

In the first group the parasites measured about 7 by 0·13 microns, and usually showed two spirals.

The second group included parasites of about the same size as the foregoing, but showing four spirals.

The third group contained parasites about 11 microns in length by 0·2 in width. These generally showed five irregular spirals and stained rather unevenly.

The parasites of the fourth group were as long, but rather thicker than those in the third group. They showed three spirals, and sometimes contained dark-staining granules.

Spores of Sarcocystis were found in the blood of cattle, sheep, and a pig. The author considers that the presence of these parasites in the blood was presumably in the nature of a contamination from the tissues of the neck, although he failed to find sarcocysts in the muscles of the neck.

In one of the cattle the spores appeared to be rather different from those found in the other animals. The pink-staining area usually present at the more pointed end was absent, and the chromatin granules forming the nucleus were more closely compacted than usual.

Filariae were found in the blood of cattle, but not in sheep, pigs, or goats. They were present in very small numbers and all appeared to belong to the same species. They were enclosed in an ample sheath. The average length was 144 microns, and the breadth 6 microns. At

the rounded cephalic extremity there was a clear area measuring about 6 microns, and at the tapering hind extremity a similar area measuring about 12 microns. In all of them there was a break in the continuity of the cells, the middle point of which was about 30 microns from the anterior end.

In the mesentery of one adult hump-backed ox an adult specimen of *Setaria labiata-papillosa* was found.

The author has found *T. pecaudi* in a large proportion of the horses and mules examined by him, and in two cases *T. vivax*. Although Glossina does not appear to breed in the immediate neighbourhood of the town they are occasionally introduced from outside through the medium of trains and motor wagons. One of the difficulties of eliminating trypanosomiasis from the horses and mules lies in the fact that cattle harbouring the parasites are allowed to wander about the streets, and thus form a reservoir for the infection of horses which is effected mechanically by Stomoxys and other genera of biting flies.

Filarial embryos were found in the blood of one horse. These were devoid of a sheath and measured about 160 microns in length by 5 in width.

In the fur of pouched rats a parasite *Hemimerus talpoides*, which according to MARSHALL may be described as "an aberrant cockroach that has taken to a parasitic mode of life," was found.

An outbreak of spirochaetosis among fowls and ducks was cut short by the intramuscular administration of 1/10 grain of atoxyl, all the birds resisting infection save one which was cured by a second injection.

No ticks could be found on the birds, but *Echidnophaga gallinaceus* was present in large numbers, and in view of the positive result recorded by MAYER of transmitting spirochaetes to canaries by this flea, an attempt was made to confirm it. The result was negative, but the fowl used was a native-bred one and the experiment was therefore not satisfactory and was only made on the chance that the bird might be susceptible.

Haemogregarines were found in the blood of snakes, toads, and lizards. The latter appeared to be far less heavily and frequently infected than was the case at Yaba, Nigeria.

(143) NIGERIA. **Annual Report. Medical Research Institute. 1914.** [CONNAL (A.) & COGHILL (H. S.).] 22 pp. F'cap. 1916. London: Published by the Crown Agents for the Colonies. [Price 2*s.* 6*d.*]

The results of the work carried out in connection with yellow fever have been reported to the Yellow Fever (West Africa) Commission, but a synopsis is given in the present report. From this the following points may be gathered.

The disease has been transmitted to guinea-pigs in series by subcutaneous and intraperitoneal inoculation. In inoculated guinea-pigs the period of incubation ranged from a few hours to two days, and the period of illness varied from a few days to several weeks. Collapse sometimes occurred in the acute stages, but in the more chronic cases there were progressive weakness and emaciation, and staring of the coat. Albumen was always present in the urine except in the early stages of the disease.

At the post-mortem haemorrhages and erosions of the gastric mucous membrane, petechiae in the pericardium and pleurae, and congestion of the liver were noted.

"*Paraplasma flavigenum*" was present in the blood constantly, sometimes within a day of inoculation, and remained there during the whole course of the disease and during the early part of the period of convalescence.

Impression preparations from the lungs, liver, and spleen show intra- and extra-corpuscular bodies which were thought to be "advanced forms" of "*P. flavigenum.*"

All attempts to obtain cultures by Bass's and Ziemann's methods failed.

Two monkeys were inoculated from infected guinea-pigs. A short febrile reaction resulted and "*Paraplasma flavigenum*" was found in the blood for a few days after the injection. A piece of spleen excised from one of them also showed the form of parasite found in the lungs, spleen, and liver of the guinea-pigs.

With a view to controlling results observations were carried out on apparently healthy guinea-pigs. Structures indistinguishable from Paraplasma were found in the blood of a number of them. The injection of their blood into other guinea-pigs failed to give rise to any febrile reaction. Albumen was never found in the urine, but in some cases petechiae were found in the mucous membrane of the stomach and there was congestion of the kidneys or even nephritis.

Some apparently healthy and normal guinea-pigs which died from unascertained causes showed petechiae in the stomach, acute inflammatory conditions in the kidneys, and albuminuria.

Reference has previously been made [see this *Bulletin*, Vol. 2, p. 143] to the discovery by CONNAL of malarial parasites in the blood of monkeys. The first three received were all found to be infected, but of fourteen afterwards examined only one showed parasites.

Two attempts to cultivate the parasite by Bass's and Ziemann's methods apparently failed, no division forms being observed in either case.

Experiments were carried out with *Stegomyia fasciata*, *Culiciomyia nebulosa*, *Ochlerotatus irritans*, *O. nigricephalus*, and *Anopheles costalis*, but in no case were any developmental forms found in the mosquitoes, nor did any of the clean monkeys become infected.

Intramuscular injections of quinine failed to cause a disappearance of the parasites.

Numerous active flagellates resembling Trichomonas were present in blood and mucus passed by goats suffering from dysentery, of which there was an epidemic at Yaba.

In the blood of 12 out of 126 pigs *T. pecorum* was found. Seven out of 22 dogs were found to be infected with a trypanosome of the *brucei* type.

T. vivax was found to be present in a large proportion of a herd of cattle brought down from the Northern Provinces. About 30 per cent. of them also showed Babesia (species not stated) in their blood. Three

were put under treatment with salvarsan or atoxyl, but in no case was a cure effected. The animals were in advanced stages of the disease when treatment was started. The drugs appeared to cause some diminution in the number of Babesia present.

The authors mention the discovery of Babesia in the blood of a pig, but give no details.

Two experiments in the cultivation of Theileria were made by Bass's method with the blood of a cow showing the parasites in small numbers as follows :—

"*Bass culture* of Theileria *No.* 1.—Bass cultures were made from one of the animals in the usual way, the incubation temperature being 40° C. The parasite, following Castellani and Chalmers (*Manual of Tropical Medicine*, 1913, p. 368), was *Theileria* (cytoplasm easily visible, division in fours, nucleus without dimorphism, bacillary forms present).

"Cow No. 17, which was the animal from which the blood was taken for cultivation, showed a somewhat scanty infection with *Theileria*. Most of the forms of the parasite were minute and rounded, only a few bacillary forms being seen. No trypanosomes were found. After five hours' incubation there were seen in addition to bacillary, rounded, pear-shaped and vibrio-shaped forms, a number of rounded bodies which contained four chromatin masses, arranged for the most part in the form of a cross, thus . . , but in a few instances arranged thus . . . , whilst other parasites contained only two chromatin masses. At 10 hours the forms dividing into four were more numerous, and the other forms had grown more rounded. It was also observed that the bacillary forms were thicker and more like a cocco-bacillus. At 13 hours the four chromatin dots had separated and there was evidence of separate cytoplasm around each mass of chromatin. At 20 hours, whilst there were still a few of the parasites which showed the early stage of the division of chromatin, in most cases the bodies were widely separated, and many erythrocytes were seen to contain four, six or eight minute *Theileria*, whilst other red cells had evidently become freshly infected with single or multiple young spores. At 23 hours the smears showed mostly larger spherical and bacillary forms, and few bodies in a state of division. At 28 hours again there was a much larger proportion of dividing forms. At 32 hours the chromatin masses in the dividing forms were beginning to separate. At 38 hours most of the forms were separate and non-dividing, sometimes three and sometimes four babesiae being present in one cell, but for the most part only one or two in each infected corpuscle. At 44 hours large pear-shaped and spherical forms were most numerous. At 50 hours there were again a few dividing forms, and a number of the single forms were swollen and apparently degenerated. At 61 hours freshly dividing forms were still present, but for the most part the parasites were large, with a single nucleus pear-shaped and spherical forms predominating, with only a few bacillary forms.

"*Bass cultures of* Theileria *No.* 2.—The same procedure was repeated with blood from the same cow, on the day following the first experiment. After two hours' incubation, spherical and bacillary forms of the parasite predominated, and the *Theileriae* were mostly single in the host cell. At four hours the appearances were the same as before, but a few dividing forms had appeared. A few trypanosomes were also observed for the first time, and erythrophagocytosis had taken place to a slight extent. At six hours, many dividing forms were observable, most of them with four chromatin divisions. At eight hours the red blood corpuscles showed a large infection with small spores, dividing forms were few, large spheres and bacillary forms being still numerous. There was mostly one or at most two parasites in each infected cell. At 14 hours the great majority of the red cells were infected, some containing large single forms in addition to dividing forms. All stages of the parasite were seen, rings, pears, spheres, bacillary and cocco-bacillary forms. At 16 hours the individuals resulting from the dividing forms were mostly separate, and each with its cytoplasm

distinct. At 18 hours there was again a large number of forms in the early stages of division. At 20 hours these dividing forms had completed the process, many red cells showing a fresh infection with young parasites. At 31 hours there were as a rule two or three parasites in each infected cell, and most of the forms were large, bacillary and pear-shaped being the commonest. At 40 hours single forms of medium size predominated. At 44 hours the individual parasites were larger, and there were a few new division forms. Some swollen and degenerating parasites were noted. At 48 hours there was again a fair number of fresh corpuscles newly infected, but degenerative signs were more marked. At 61 hours a large proportion of the parasites was degenerated.

"The cultivation of the parasite enabled its nature to be established with more certainty than could have been done by examination of smears from the peripheral blood.

"Schizogony took place several times during the first 48 hours; thereafter degenerative changes set in.

"It would appear that the fine bacillary or vibrio-shaped forms grew into the more swollen cocco-bacillary parasites which did not show any division of the chromatin. Presumably these were the gametocytes. Attempts to transmit the infection to guinea-pigs by intraperitoneal and subcutaneous inoculation failed."

The paper contains lists of the mosquitoes, flies, ticks, and helminths collected.

RECENT LITERATURE.

[Continued from this *Bulletin*, Vol. 4, No. 1, pp. 47–49.]

Leishmaniasis.

(144) Bouilliez (M.). Un cas de Kala-azar infantile au Moyen-Chari (Territoire du Tchad). [A Case of Infantile Kala-azar at Moyen-Chari (Chad Territory).—*Bull. Soc. Path. Exot.*, 1916. May. Vol. 9. No. 5. pp. 299–302. With 1 text-fig.

(145) Escomel (E.). Contribution à l'étude de la Leishmaniose américaine (Laveran et Nattan-Larrier), Formes et variétés cliniques. [Clinical Varieties of American Leishmaniasis.]—*Bull. Soc. Path. Exot.*, 1916. Apr. Vol. 9. No. 4. pp. 215–219.

(146) Rogers (L.) & Hume (N. H.). The Treatment of Kala-azar (Indian Form) by Tartar Emetic intravenously and by Inunctions of Metallic Antimony.—*Brit. Med. Jl.*, 1916. Feb. 26. pp. 301–303.

Spirochaetosis.

(147) Fantham (H. B.). Spirochaetes and their Granule Phase.—*Brit. Med. Jl.*, 1916. March 18. pp. 409–411.

(148) Noguchi (H.). Certain Alterations in Biological Properties of Spirochaetes through Artificial Cultivation.—*Ann. Inst. Pasteur*, 1916. Jan. Vol. 30. No. 1. pp. 1–4.

Biting Flies and Ticks.

(149) d'Anfreville (L.). Les Moustiques de Salé, Maroc. [The Mosquitoes of Salé, Morocco.]—*Bull. Soc. Path. Exot.*, 1916. Mar. Vol. 9. No. 3. pp. 140–142. With 6 text-figs.

(150) Lamborn (W. A.). Third Report on Glossina Investigations in Nyasaland.—*Bull. Entom. Res.*, 1916. May. Vol. 7. No. 1. pp. 29–50.

(151) Lloyd (Ll.). Report on the Investigation into the Bionomics of *Glossina morsitans* in Northern Rhodesia, 1915.—*Bull. Entom. Res.*, 1916. May. Vol. 7. No. 1. pp. 67–79. With 2 text-figs. and 1 plate comprising 2 figs.

(152) Turner (R. E.). On Mutillidae Parasitic on *Glossina morsitans*.—*Bull. Entom. Res.*, 1916. May. Vol. 7. No. 1. pp. 93–95. With 2 text-figs.

Helminths.

(153) Pratt (H. S.). The Trematode Genus *Stephanochasmus* Looss in the Gulf of Mexico.—*Parasitology*, 1916. Jan. Vol. 8. No. 3. pp. 229–238. With 1 plate comprising 10 figs.

(154) Railliet (A.) & Henry (A.). Sur les Oxyuridés. [The Oxyuridae.]—*C. R. Soc. Biol.*, 1916. Feb. 5. Vol. 79. No. 3. pp. 113–115.

(155) Railliet (A.) & Henry (A.). Nouvelles remarques sur les Oxyuridés. [New Remarks regarding the Oxyuridae.]—*C. R. Soc. Biol.*, 1916. Apr. 1. Vol. 79. No. 7. pp. 247-250.

(156) Ravenna (E.). Sulla tossicità dei liquidi parassitari.—Ricerche sperimentali. [The Toxicity of Liquids obtained from Parasites. Experimental Researches.]—*Jl. Mod. Zooiatro.* Parte Scientifica, 1916. Mar. 31. Vol. 27. Ser. 5. (Vol. 3.) No. 3. pp. 61–84.

(157) Seurat (L.-G.). Sur les Oxyures des Mammifères. [The Oxyurides of Mammals.]—*C. R. Soc. Biol.*, 1916. Jan. 22. Vol. 79. No. 2. pp. 64–68. With 3 text-figs.

(158) Seurat (L.-G.). Sur l'habitat normal et les affinités du *Protospirura numidica* Seur. [The Normal Habitat and the Affinities of *Protospirura numidica* Seur.]—*C. R. Soc. Biol.*, 1916. Feb. 5. Vol. 79. No. 3. pp. 143–146. With 4 text-figs.

(159) Seurat (L.-G.). Sur l'habitat normal et les affinités du *Rictularia proni* Seur. [The Normal Habitat and the Affinities of *Rictularia proni*.]—*C. R. Soc. Biol.*, 1916. Feb. 5. Vol. 79. No. 3. pp. 146–149. With 2 text-figs.

Protozoa.

(160) Chatton (E.) & Blanc (G.). Précisions sur la Morphologie de l'hématozoaire endoglobulaire de la Tarente : ***Pirhemocyton tarentolae*** Chatton et Blanc. [Details of the Morphology of the Intracorpuscular Parasite ***Pirhemocyton Tarentolae.***]—*C. R. Soc. Biol.*, 1916. Jan. 22. Vol. 79. No. 2. pp. 39–43. With 1 text-fig.

(161) Sangiorgi (G.). Di un Coccidio parassita del Rene della Cavia. [A Coccidium Parasitic in the Kidney of the Guinea-pig.]—*Pathologica*, 1916. Feb. 15. Vol. 8. No. 175. pp. 49–53.

Miscellaneous.

(162) Conor (M.). Les invasions de Sauterelles en Afrique Mineure (Figurations et Textes anciens). [The Invasions of Locusts in Africa (Ancient References).]—*Arch. Inst. Pasteur Tunis*, 1916. Apr. Vol. 9. No. 3. pp. 149–156. With 1 plate and 1 text-fig.

(163) Cosco (G.) & Angelo (A.). La Virulenza del Sangue degli Animali malati di Afta epizootica. [The Virulence of the Blood of Animals affected with Foot and Mouth Disease.]—*Clinica Vet.*, 1916. Apr. 15. Vol. 39. No. 7. pp. 193–195.

(164) Hall (J. C.) & Stone (R. V.). The Diphtheroid Bacillus of Preisz-Nocard from Equine, Bovine, and Ovine Abscesses. Ulcerative Lymphangitis and Caseous Lymphadenitis.—*Jl. Infect. Dis.*, 1916. Feb. Vol. 18. No. 2. pp. 195–208.

(165) d'Herelle (F.). Campagne contre les *Schistocerca peregrina* en Tunisie par la méthode biologique. [Campaign against Locusts in Tunis on Biological Lines.]—*Arch. Inst. Pasteur Tunis*, 1916. Apr. Vol. 9. No. 3. pp. 135–148.

(166) Kolmer (J. A.) & Smith (A. J.). The Bactericidal and Protozoacidal Activity of Emetin Hydrochloride in Vitro.—*Jl. Infect. Dis.*, 1916. March. Vol. 18. No. 3. pp. 247–265.

(167) Kolmer (J. A.) & Smith (A. J.). The Bactericidal and Protozoacidal Activity of Emetin Hydrochloride in Vivo.—*Jl. Infect. Dis.*, 1916. Mar. Vol. 18. No. 3. pp. 266–276.

(168) Retterer (E.) & Neuville (H.). De la rate du Rhinocéros et du Tapir. [The Spleen of the Rhinoceros and of the Tapir.]—*C. R. Soc. Biol.*, 1916. Apr. 1. Vol. 79. No. 7. pp. 267–270.

(169) Ries (J.-N.). Sur la pathogénie et le traitement de l'anémie pernicieuse et infectieuse du cheval. [The Pathology and Treatment of Equine Pernicious and Infectious Anaemia.]—*Receuil de Méd. Vét.*, 1916. Jan. 15–Feb. 15. Vol. 92. Nos. 1 & 2. pp. 14–20.

(170) Terni (C.). Ricerche ed esperienze per lo Studio della immunità all' Afta. [Immunity against Foot and Mouth Disease.]—*Clinica Vet.*, 1916. May 15. Vol. 39. No. 9. pp. 257–261.

BRITISH MUSEUM 10 JUL 16